Growth Performance of Quail Hen (*Coturnix coturnix Japonica*) Fed with Different Energy Levels During Rearing until Point of Lay

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Abstract : Growth performance responses of 300 quails hen to qualitative feed restriction during rearing were measured. The research was an experimental observation applying Complete Randomized Nested Design. The quails maintained under two feeding restriction programs feeding allotted to 2 dietary regimes, based on Metabolize Energy (ME) R1= 2900 kcal/kg; R2 = 2800 kcal/kg and quantitative restricted feeding; P0 = 100% of *ad libitum*; P1 = 90% of *ad libitum* and P2 = 80% of *ad libitum* (N= 300). Each group (n= 50) has five replicates containing 10 birds each. Restricted feeding treatment is done for fourteen days old quail until its sexual maturity. After its sexual maturity, the feeding is given in *ad libitum*. Observation is conducted for the feed consumption, the body weight gain, the feed conversion in growth period, and days to first egg. The results of experiment indicate that the restricted feeding consequently decreasing ($P<0.01$) on the body weight gain and feed conversion, however, it did not show significant influence ($P>0.05$) on body weight at sexual maturity. Restricted feeding 80% ad libitum significantly ($P<0.01$) delayed the days to first egg until 9 days. Growth performance of quail was not affected by both of the energy metabolize of ration. Due to the best conversion ratio, it's suggested that feed restriction 90% ad libitum with EM 2900 kcal/kg can be used without reduction quail production performance.

Introduction

The most expensive items in the cost of a complete feed are protein and energy where energy alone contributes to about 70% of the total cost of poultry diets. Any effort to improve commercial poultry production and enhance its efficiency needs to emphasize on better utilization of feeding management. Furthermore, both dietary energy and protein represent approximately 85% of total feed cost [1]. Hence, it is to be expected that many programs will be made to reduce their use in the rations without lowering performance. Many of these restriction programs involve low protein and energy feeding regimes

Different feeding schemes used in poultry industry are feeding time period, sequential feeding, choice feeding, restricted feeding and among all modifying growth pattern by quantitative feed restriction and stimulating compensatory growth is a successful approach in managing the scarcity of feed stuffs [10]. The use of feed restriction program in broilers may elicit compensatory growth, improved feed efficiency and birds are not exposed to sub optimal level of nutrients but the efficiency of utilization of these nutrients may be changed.

Research of [5] proposed that physical feed restriction at early age of birds for a short period may elicit compensatory growth, improved feed efficiency, reduced abdominal fat pad, and at market age restricted birds performed similar to full fed birds. Equal body weight gain between *ad libitum* and 10% feed restricted groups of Japanese quails also was observed by [3] .

There is little or limited information concerning the use of qualitative and quantitative feed restriction as a nutritional approach to reduce cost of feeds or problems associated with egg production in Japanese quail hens. Therefore, the present study aimed to assess the effect of qualitative feed restriction on growth performance of quail hen.

Materials and Methods

Three hundred (300) day old quail, procured from local farm hatchery at Kediri, East Java, were fed *ad-libitum* for the first 14 days as adaptation period. Starts at 15 d quail hen were allocated randomly into 2 experimental groups according to a 2×2 completely randomized nested design arrangement for two feeding methods, energy metabolize of ration (2900 Kcal/kg and 2800 Kcal/kg) and quantitative restricted feeding (*ad libitum*, 90% *ad libitum*, 80% *ad libitum* were applied, each treatment was replicated five times. The experimental birds were maintained under optimum husbandry practices of temperature, humidity and ventilation. All the experimental bids were provided the quail starter feed containing 24 percent crude protein level as recommended by (NRC, 1994) throughout the experimental period is shown in Table 1 and water *ad libitum* during the experiment. Water was provided via automatic nipple drinkers. All birds were fed accordingly the treatment diets from 14 d to 42 d of age and maintained until the first laid egg seen. The amount of feed consumption given by ad libitum is obtained from the results of preliminary research. The quail used in this preliminary study was separate but the number of replications and environmental conditions are the same. The amount of rations consumed by quail in this preliminary study was called ad libitum feed consumption and was the basis of the feeding system in this study

Table 1. Composition and calculated analysis of experimental diets offered to quail hens from 1 to 42 days of age

Variables	R1		R2	
Maize (%)	0.40		0.30	
Rice Bran (%)	0.07		0.18	
Concentrate Feed (%) (Comfeed Ltd.)	0.53		0.52	
	Calculated Analysis			
Protein (%)	24.01	23.6	24.01	23.9
Fat (%)	4.95	3.3	5.66	3.9
Crude Fiber (%)	5.28	2.8	5.77	3.1
Ca (%)	1.37	-	1.34	-
P(%)	0.76	-	0.90	-
Metabolize Energy (kcal/kg)	2916.56	2930**	2822.40	2830**

** Estimation of Gross Energy

Body weight gain and feed intake data were determined on 42 d of age. The quail was individually weighed and mortality was recorded as it occurred. Data were analyzed by analysis of variance and the least squares means test.

Result and Discussion

The effects of feed restriction on growth parameters are given in Table 2. ($P<0.05$) Feed intake was recorded significantly higher in *ad-libitum* with Energy Metabolize (EM) at 2800 kcal/kg level. Significantly higher feed intake in full fed as compared to restricted fed birds was observed in quail [7].

Feed restriction caused a reduction in body weight gain during the period of feed restriction. Body weight of the 80% *ad libitum* feeding was lower than that of the 100 % ad libitum feeding both on EM ration. During the restriction period, the restricted until 80% ad libitum with EM 2900 kcal/kg had very high feed conversion ratio ($p<0.05$), which could be due to a high persentase of the feed being used for maintenance. However, during re feeding period the control group had very low feed conversion compare with restricted feeding treatment

Body weight at sexual maturity was not influenced by restricted feeding ($p>0.05$). The body weight of quail with feeding *ad-libitum* has the highest body weight of 187.67 grams and the lowest at the feeding rate of 80% of 167.00 grams. Delays to the sexual maturity of quail that fed restricted due to the lack of optimal body weight, this is supported by the opinion of [1] who suspect that it takes a certain body weight and age to finalize on each strain of poultry.

Table 2. Means of Feed intake (g), body weight gain (g), FCR, feed efficiency and mortality (%) in Japanese quails maintained under feed restriction regimes until 42 d

Energy Metabolized of Ration (Kcal/kg)	Restricted Feeding	Total feed Intake (g/birds)	Weight gain (g/bird)	Feed conversion
2900	100 %	492.82±26.32^{a}	97.02±3.75^{a}	5.09±0.35^{a}
	90% Ad libitum	443.38±8.74^{b}	91.26±3.11^{a}	4.86±0.20^{b}
	80% Ad libitum	409.73±3.29^{c}	65.20±8.33^{b}	6.12±0.44^{c}
2800	Ad libitum	497.03±15.06^{a}	91.70±2.98^{a}	5.43±0.26^{a}
	90% Ad libitum	449.38±3.82^{b}	73.12±6.55^{b}	5.29±0.19^{a}
	80% Ad libitum	408.26±0.81^{c}	67.89±8.18^{b}	6.28±0.47^{b}

a,b,c means within same row with different superscripts are significantly different ($p\leq0.05$).

Table 3. Means of body weight at sexual maturity and days to first egg in Japanese quails maintained under feed restriction regimes until 42 d

Energy Metabolized of Ration (Kcal/kg)	Restricted Feeding	Body weigt at sexual maturity (g/birds)	Days to First Egg
2900	100 %	187.4±8.85	44.80±1.79 [a]
	90% Ad libitum	172.4±8.62	46.00±1.00 [a]
	80% Ad libitum	169.6±14.57	53.60±1.52 [b]
2800	Ad libitum	185.4±15.13	43.60±2.30 [a]
	90% Ad libitum	177.2±12.32	50.80±1.92 [b]
	80% Ad libitum	174.4±10.60	53.20±3.03 [b]

Feed restriction 80% *ad libitum* both of EM of ration delayed ($p<0.05$) the onset of egg production 9 days compared to *ad libitum* fed quails as shown at Table 3. However, due to their early age of sexual maturity, quail may also exhibit an accelerated growth following early feed restriction in order to obtain the minimum body weight required for sexual maturity The results with respect to first egg weight was confirm previous reports [3] that early feed restriction did not affect to the weight of sexual maturity in quail. In the present research, decreasing of the body weight of restricted quail might have delayed onset of egg production, because body weight and body fat of birds are important factors as the primary determinant for onset of lay [6]. A lack of nutrients during the growing period might also delay the initiation of egg production. In practice, delayed the onset of egg production may play a role in maintaining of egg peak production and reduction of prolapsed problems [6]. Indeed, [3] suggested that feed could be restricted to 85 or 70% of *ad libitum* feed consumption from 14 to 35 d of age without detrimentally affecting egg production and reproductive parameters of quail from 42 to 91 d of age.

Conclusion

Energy metabolize 2900 kcal/kg of ration results in better feed conversion and not affected on body weight at sexual maturity and there is no differences on body weight gain between restricted feeding 90% *ad libitum* and *ad libitum* feeding. Feed restriction 90% *ad libitum* with EM 2900 kcal/kg can be used without reduction quail production performance

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